December, and a syllabus for the present year has been received. Among subjects to be dealt with this session we notice Mendel's law of heredity, physical and geological problems suggested by the construction of the Arthur's Pass Tunnel, bird life in New Zealand, and Antarctic exploration. The council of the institute has in hand the publication of reports that will be made on the collections secured during the recent sub-Antarctic expedition to the Auckland and Campbell Islands, and has taken steps to secure the proper investigation of scientific questions which will be raised by the boring of the Arthur's Pass Tunnel. Mr. E. G. Hogg, of Christ's College, is the president of the institute; Mr. R. Speight, of Canterbury College, the honorary secretary; and Dr. Chas. Chilton, of Canterbury College, the honorary treasurer.

THE issue of *Science* for June 5 contains an interesting symposium at the Illinois State Academy of Science on the opportunities for American young men in science. Prof. J. G. Coulter deals with the opportunities available in botany, Prof. W. A. Noyes with openings for chemists, Dr. H. Foster Bain with the outlook in geology, Prof. H. Crew that in physics, and Dr. H. V. Neal that in zoology. There is a fair unanimity among the contributors that the young man whose primary object is to make money should not select as his life's work the pursuit of pure science. It is curious to remark that Prof. Coulter referred to the lack of interest in science on the part of the American public, and traced it to the same cause as was suggested in the *Times* correspondence arising out of the speeches at last year's Royal Society dinner to account for the similar apathy in this country, that American men of science rarely make it their duty properly to popularise the problems on which they are at work. Prof. Coulter stated that in America the demand for trained botanists continues to exceed the supply. Prof. Noyes estimated that there are about 8000 chemists in the United States, and concluded by saying that the demand for chemists to fill positions in connection with the bureau of chemistry has largely exceeded the supply of suitable men. Dr. Bain made it clear that it may be taken for granted that properly equipped and willing workers in geology may rest assured of positions being open to them. Prof. Crew summarised the opportunities for young men in physics under the headings of research, applied physics, engineering, and teaching, and spoke very hopefully of the outlook in each of these directions. Dr. Neal said, so far as zoology is concerned, that the chances for getting good zoological positions have much improved during the last ten years. Though there is this increased demand, there has been no increase in the supply of men to fill the posts. New fields for employment are being opened, and there is every possibility that the present demand for zoologists will be maintained.

PROF. E. B. POULTON'S "Essays on Evolution" are to be published by the Oxford University Press on July 1, the fiftieth anniversary of the meeting of the Linnean Society at which was read the joint essay on natural selection by Darwin and Wallace. The ten essays cover the period 1889–1907.

MESSRS. E. AND F. N. SPON, LTD., have published, at 4*d*. net, tables of logarithms, antilogarithms, useful constants and the functions of angles, taken from the examination tables of the Board of Education. The tables are mounted on linen, and so folded that they will go into the pocket easily; they can be opened out in such a way that the logarithms and antilogarithms can be examined side by side.

THE first part of the "International Geography" by seventy authors, edited by Dr. H. R. Mill, has now been published separately by Messrs. Macmillan and Co., Ltd., at 1*s*. 6*d*. This section, which deals with the principles of geography, is the eighth portion of this standard book to be issued in a convenient separate form, and at a price which makes it available as a class-book in schools. These parts of the "International Geography" deserve to be widely used in schools where the study of geography is taken seriously.

WE have on previous occasions directed attention to the medical and scientific circulating library conducted by Mr. H. K. Lewis, of Gower Street, London, W.C. The new edition of the library catalogue, revised to the end of 1907, has been published recently at a price of 2*s*. net to subscribers and 5*s*. net to non-subscribers. The catalogue shows that the student and man of science may here obtain the advantage of a very large collection of modern medical and scientific text-books and special monographs. In addition to books on pure and medical science, works on different branches of engineering science and general technology are included. Not only are the books classified under their authors' names, but they are also conveniently arranged in a second section according to subjects.

OUR ASTRONOMICAL COLUMN.

THE RINGS OF SATURN.—In a note published as Bulletin No. 32 of the Lowell Observatory, Prof. Lowell develops rather more fully the idea that the appendages B and C of Saturn are not flat rings, but tores. He arrives at this conclusion, by two independent methods, from a discussion of the phenomena observed at Arizona during November and December last. In the first place, a black core was observed running medially through the length of the shadowy band which then encircled the planet. This core was seen by all the observers at Flagstaff, although not caught by Prof. Barnard at Yerkes nor reported in the Lick observations, and is presumed to be the black shadow of the plane ring A bordered by the particles of the rings B and C scattered above and below the plane of A. That is to say, the rings B and C differ from A in being tores and not flat rings. Then the agglomerations, seen at many different observatories, are shown to be better accounted for by Prof. Lowell's theory of the form of the rings than by the several other theories which have been proposed. An analytical discussion of the perturbing effects to which the ring matter is subjected by the satellites, &c., shows that the assumed heaping up of the particles, as indicated by the agglomerations, is in accordance with gravitational laws. Furthermore, it is shown from the observational results that the inevitable disintegration of the rings is in the process of taking place.

THE FORTY-INCH OBJECTIVE OF THE YERKES OBSERVATORY.—An interesting paper by Mr. Philip Fox, giving the results of an investigation of the 40-inch objective of the Yerkes Observatory, appears in the May number of the *Astrophysical Journal* (vol. xxvii., No. 4, p. 237). The tests, in the first instance, were carried out at the suggestion of Prof. Hartmann, who is desirous that the data might be published for every objective in active use, but they have been extended and comprehensively discussed by Mr. Fox. The method employed was that of the "zonal test," using a perforated diaphragm having sixty holes, each of 2 cm. diameter, located at the corners of squares on fifteen different zones. Briefly, the results indicate, *inter alia*, that the centre of the Yerkes objective is of appreciably shorter focal length than the edge. The variations come, however, well within the limits for which Prof. Hartmann classifies an objective as "preeminently good." Plates taken at varying zenith distances appear to indicate that the performance of the objective varies with the zenith distance, and, should this be confirmed, it appears certain

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that, even could the mechanical difficulties of construction be overcome, refractors of greater dimensions than the 40-inch cannot be constructed with the hope of uniform performance at all altitudes.

The same journal contains a discussion by Prof. Hartmann of an improvement of the Foucault knife-edge test in the investigation of telescope objectives.

THE TEMPERATURE OF THE SUN.—In a preliminary note, now published as an abstract from the *Annalen der Physik* (vol. xxv., pp. 905–20, 1908), Dr. Goldhammer discusses anew several sets of results obtained in the determination of the temperature of the sun. From the discussion of Langley's various observational data he arrives at the conclusion that the probable actual temperature of the sun is not less than 10,000° absolute.

THE VARIATION OF THE POLE.—Prof. Albrecht's annual summary, for 1907, of the provisional results derived from the observations made at the various international latitude stations appears in No. 4253 of the *Astronomische Nachrichten* (p. 73, June 5). The extrapolated values for the variation, in the several coordinates, for 1908·0 are:— $x = -0''{\cdot}097$, $y = +0''{\cdot}185$, and $z = +0''{\cdot}012$. The curve showing the departure of the pole from the mean position between 1899·9 and 1908·0 shows that the value of the y variation at the commencement of the current year was approaching the maximum observed during that period.

OBSERVATIONS OF THE PERSEID SHOWER IN 1907.—No. 4253 of the *Astronomische Nachrichten* (p. 83, June 5) contains a note by Prof. J. Sykora in which are given the results of the meteor observations made at Tashkent and Iskander during the nights of August 10–12, 1907; Iskander lies about 44 kilometres to the north-east of Tashkent. From the recorded paths of 178 Perseids the centre of the radiant of the shower, for 1907, was found to be $\alpha = 42°{\cdot}7$, $\delta = +53°{\cdot}8$, and the area covered by the radiants lay between 31° and 55° in R.A. and +49° and +59° in declination. The calculation of the altitudes showed that the mean heights of appearance and disappearance were 167 and 96 kilometres respectively. The trails of nine meteors were photographed, and brief descriptions of trails are given in the paper; several of them indicate marked variations of brightness during the meteor's flight.

RECENT DEVELOPMENTS IN ELECTRIC LAMPS.

IN an article which appeared in NATURE last June the present writer reviewed briefly some of the improvements which had been made and promised in incandescent electric lamps. At the time that article was written, matters were in a condition of considerable uncertainty on account of the great number of new developments which had been announced, the value of which was, to a very large extent, uncertain. The frequent announcements of these improvements, which were appearing almost weekly, led electrical engineers to feel considerable hesitation in adopting any new lamp for fear that it should be superseded almost immediately after its adoption. Since that time the position has become much quieter, and during the past six months the solid progress which has been made in the introduction of these lamps on the market has been remarkable. Now that considerable experience has been obtained of the practical working value of the different types of lamp, a favourable opportunity is afforded of taking a general survey of the present position and prospects for the future. At the same time, a similar survey may be taken of the conditions existing in the field of arc lighting, in which the developments during the past two or three years have been almost equally noteworthy.

Incandescent Lamps.

As was pointed out in the article referred to above, the only two lamps which appeared to merit particular attention were the tungsten and the tantalum lamp. The tantalum lamp has now been in practical use for about two years, and has not undergone any appreciable modification since the time of its first introduction. Difficulties of producing a satisfactory lamp for use with alternating current are still not overcome, and the difficulties of drawing tantalum wire sufficiently fine to enable either low candle-power low-voltage, or medium candle-power high-voltage lamps to be produced still await practical solution. It is true that the range of candle-power with low-voltage lamps has been extended by the introduction of a 16-candle-power lamp, and that announcements have been made from time to time that a satisfactory solution has been found for the manufacture of high-voltage lamps. The fact remains, however, that high-voltage lamps are not yet produced commercially. The tantalum lamp has satisfactorily proved its value for electric lighting. Although the general results obtained seem to show a comparatively short average life of about 700 hours, and though the efficiency is approximately only half that of the newer tungsten lamp, it is apparent that this lamp will have to be reckoned with for some time to come as a very important factor in the field of incandescent electric lighting. Though it may not be able to compete on the score of efficiency with the tungsten filament, yet the greater strength of the filament must always operate to counterbalance these disadvantages.

The tungsten lamp, ever since its commercial introduction into this country under the name of the "Osram" lamp by the General Electric Company, has made rapid strides in popularity. Considering that the lamp has only been on the market for a matter of about nine months, its very widespread use at the present time must mark almost a record in the development of electric lighting. In its practical performance, also, this lamp has fulfilled, or more than fulfilled, the hopes which were raised for it before its introduction. Beyond the blackening which occurs with a small percentage of these lamps, the general experience is that a life of 1000 to 1500 hours is obtained almost without any decrease in the initial efficiency of about 1¼ watts per candle. This blackening appears to be a defect in manufacture which will doubtless be soon overcome, since it is not a characteristic of all lamps, but is only observed in a very small percentage, which generally show this defect almost immediately they are put into use. The tungsten lamp has hitherto possessed the disadvantage, when compared with its tantalum rival, that it could only be used in a vertical position, but a modified type has just been introduced which can be burnt at any angle. On the other hand, the tungsten lamp has the advantage that it is suitable for use on either direct- or alternating-current circuits. Up to the present, the range of voltage for which the lamps can be made is practically the same as that for the tantalum lamps, viz. voltages up to 130, but the tungsten lamp has not yet been made for voltages of 100 in such low light units as the tantalum lamps, the lowest at present obtainable being approximately thirty candles. Tungsten lamps have also been made, but not yet commercially introduced, for high voltages (200 and above), and the introduction of a 40-candle-power lamp for 200 volts is promised very shortly.

It is yet too early to say precisely what will be the effect of the introduction of these two lamps on electric lighting in general. At present, for the most part probably, the lamps have been used for the lighting of factories, shop windows, and public or semi-public places where costs of lighting are very closely considered and artistic effects are of secondary importance. It is perhaps not safe to argue from the success which the lamps have attained in the past year for these purposes that they will meet with corresponding success in private house lighting, especially as in that case the size of the light unit becomes of much greater importance. It is more than probable, however, that the general public will welcome the higher light units if they provide them, as these lamps do, with a means at the same time of actually reducing their lighting bills. The present writer, for example, has substituted two 32-candle-power Osram lamps for a single 16-candle-power carbon filament lamp, and finds that it has resulted in actual saving in money in spite of the fact that four times as much light is obtained. It is noteworthy that the fears which were expressed that the difficulties in running lamps in series would very seriously

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